

## A COMMON SOURCE OUTBREAK OF CUTANEOUS LARVA MIGRANS

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CUTANEOUS larva migrans, often called creeping eruption, is caused by larval nematodes entering the skin of the poorly adapted human host. The linear cutaneous eruptions that result have been noted since the late 1800's; however, Kirby-Smith and co-workers in 1926 proved the causative agent to be the feline or canine strain of the cat hookworm, *Ancylostoma braziliense* (1). *Uncinaria, necator, bunostomum*, and other species of *Ancylostoma* have been incriminated occasionally; however, natural exposure to *A. braziliense* is by far the most frequently reported cause of cutaneous larva migrans.

During the construction of a new hospital at Patrick Air Force Base in Florida, a group of workmen developed an unusual dermatitis. When I was informed of this on September 2, 1964, I visited the construction area.

The general foreman said that seven of the nine men (a painter and pipefitters) who worked in the 3-foot-high crawl space (an area of 41,000 square feet) under the new hospital had an extremely irritating skin malady. The workers believed that they had contracted it in the crawl space and declared that unless the situation was remedied, they would walk off the job. The foreman called eight of the men from the crawl space (the ninth man was visiting his physician for treatment), so that I could see their lesions. Five men had lesions typical of those caused by *A. braziliense*. One man's lesions were those of an atypical infection. Two men apparently were not yet infected.

### Case Descriptions

Following are descriptions of the lesions of three of the men. Employees 1 and 2 had typical linear erythematous, elevated, vesicular lesions which showed definite serpiginous tunneling between the stratum germinativum as a

roof and the corium as a floor (2) of the skin of the arms and legs. Employee 3 had an atypical diffuse lesion of the left upper quadrant of the back. Employee 1, whose arm lesions are shown in figure 1, first noted them approximately 3 weeks earlier and was infected on both arms and both legs. Home remedies were applied with little success. The employee stated that highly volatile liquids, when applied to the lesions, did partially relieve the intense itching sensation. The physician he had seen 1 week before my visit had prescribed an ethyl chloride spray once a day to freeze and thus kill the larvae. The man had been instructed to spray the forward end of the lesion and one-half inch in front of the lesion.

Freezing of the skin with ethyl chloride or solid carbon dioxide, or burning of the skin with phenol, produces a bleb. The larvae in the superficial portion of the epidermis is thus separated from the host by the vesicle fluid and eventually is lost with the epidermal slough.

Employee 2, whose arm lesions are shown in figure 2, became infected approximately 2 weeks prior to my visit. Experimentation with mercuriolate, iodine, and fingernail polish for 1 week gave him little relief. The tunneling proceeded at such a rapid pace and evoked such an intense pruritis that he abraded numerous lesions and surrounding areas of healthy skin by scratching to compensate for the torturous

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itching. The progress of the infection, the lack of relief from remedies, and the secondary pyogenic lesions developing caused the man to seek medical aid, which was essentially the same treatment as that prescribed for employee 1.

Employee 3 first noted his lesions 5 days before I saw him. His back lesions seemed to originate from massive penetrations of larvae in a rather circumscribed area of the left upper quadrant of the back (fig. 3). Taking advantage of the other employees' experience with their infections, he sought medical aid 3 days after noting the lesions. Treatment and advice were similar to that given employees 1 and 2. Early therapy and the apparent massive penetrations in a rather small area could well account for the atypical appearance of the lesions.

All three men had isolated reddened papules which itched intensely, evidence of new areas of infection. Lesions on the other men were similar but less severe than those described.

#### The Common Exposure Area

Detailed questioning of the men revealed that the only recent experience they had in common was their work in the crawl space under the hospital. In the exposure area, the crawl space, the soil was a light, moist, sandy loam, completely shaded by the concrete floor of the building. The workers, mostly clad in T-shirts and cotton twill or denim trousers, hanged, fitted, joined, sealed, and painted pipes suspended from the floor above. The men lay on their backs or sides in the sand most of the time.

Several small openings in the outer walls of the structure and the main entrance from the floor above provided little ventilation. Artificial light illuminated work areas. The seven infected men crawled and moved frequently about large areas, while the two not infected were performing specialized work confined to one small area, away from the natural openings to the crawl space. Investigation revealed that no fill had been brought into the crawl space area, uninhabited terrain which had been graded before construction started.

All employees queried said that they had seen dogs and cats in the work area and had noted tracks of domestic dogs and cats when they arrived for work in the mornings. One employee stated that some of the tracks were those of wild cats visiting the crawl space at night.

#### Discussion

The diagnosis of cutaneous larva migrans having been established clinically by the typical appearance of the lesions, and the crawl space beneath the new hospital providing for such a well-supported common source of infection, it was concluded that the sandy, well-shaded soil, in which the employees constantly crawled and worked, was grossly infested with infective filariform larvae of *A. braziliense*.

*A. braziliense*, the smallest of the *Ancylostoma* species, occurs in the small intestine of domestic and feral dogs and cats. It is specially prevalent in the southeastern United States, with a particularly high incidence in these hosts in Florida (2). In moderate infec-

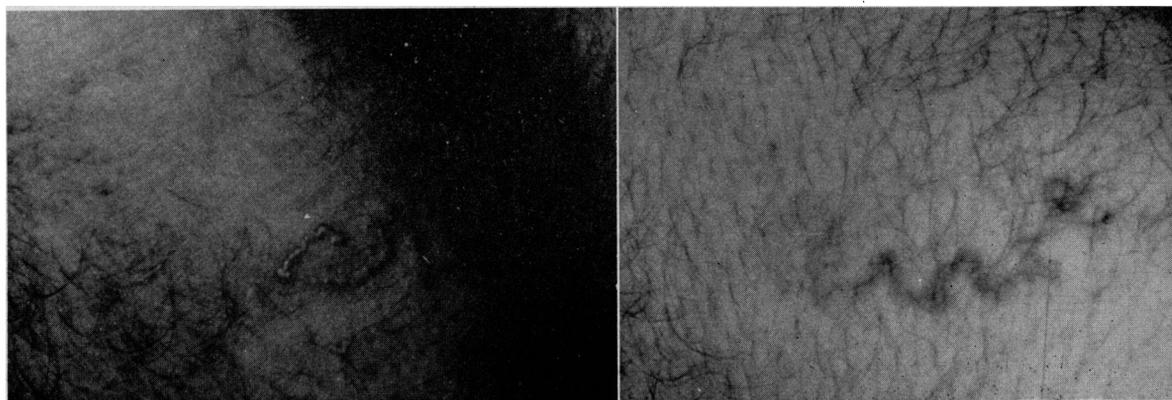


Figure 1. Arm lesions of employee 1

tions 20,000 eggs may be produced daily per female *Ancylostoma*. Veterinary parasitologists frequently consider 200 hookworms per cat or dog to warrant classification as a heavy infection.

At 86° F., close to the August mean temperature at Patrick Air Force Base, the eggs hatch in 10 to 12 hours and pass through 2 rhabditiform molts to the infective filariform third-stage larvae in 58 to 66 hours. The most favorable environment for the development of the eggs is a sandy loam soil in moist shady places. The larvae rarely develop in other soils. Both freezing temperatures and drying prevent development of ova and larvae.

The frequent observations of tracks and signs of dogs and cats in the crawl space led me to suspect that the soil was infected after the construction site had been graded. The nocturnal habits of cats—their food quests, other pursuits, and their fondness for the seclusion offered by the easily accessible crawl space—led me to conclude that feline feces had served as the vehicle for seeding the area with viable ova. Because of cats' habit of covering their excreta, it was not easily discernible in the sandy soil, and the men, working while lying on their backs or sides in the half-light, were unaware of skin contact with fecal material.

Unfortunately because of other work priorities and the large area in the crawl space, no examination was made of the soil itself.

### Recommendations

To improve the working environment in the crawl space, I made the following recommendations to the general foreman.

1. Screen all natural entrances to the crawl space to exclude animals, but allow maximum natural airflow through the area. Install a heavy-gauge hardware-cloth trapdoor so that the main employee entrance could be closed at the end of work periods.

2. Secure the services of a bonded, reliable pesticking concern to apply a larvicide to the soil of the crawl space during a 2- or 3-day non-working period.

3. Sodium borate at concentrations of 10 pounds per 100 square feet of soil has been recommended by the Florida State Board of

Health as an efficacious larvicide for *A. braziliense* larvae. This product is also an efficient herbicide. (Sodium borate was recom-

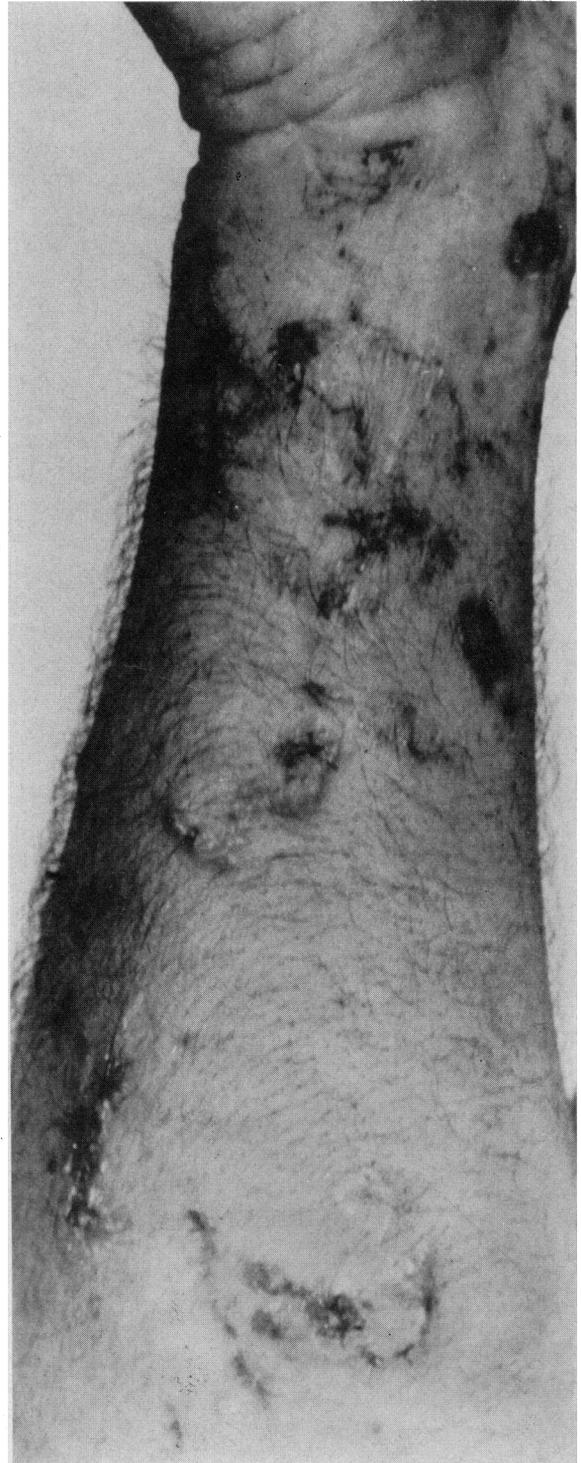


Figure 2. Arm lesions of employee 2

mended as an efficient larvicide to the foreman; however, because skin toxicity factors were not readily available, it was suggested that the pesticide concern be informed that the men's bodies might come in contact with the soil.)

4. Encourage employees to shower immediately after work to remove soil quickly from their skin.

5. Suggest that employees wear long-sleeved shirts buttoned at the wrists and secure their trousers around the ankles, if temperature, humidity, ventilation, and body respiration factors permitted.

6. Use heavy plastic sheeting to lie on to separate the workmen's bodies from the soil, when possible.

7. Urge employees to seek treatment promptly for new infections.

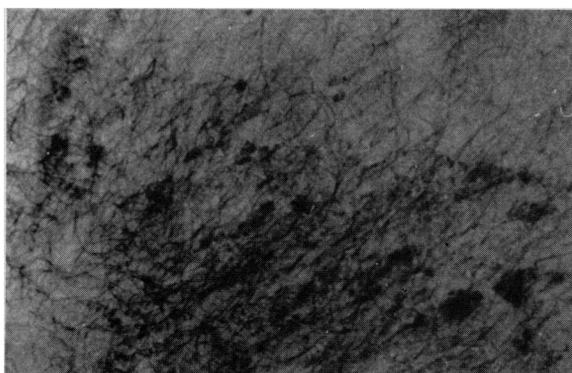
The use of various ointment-base repellents against cercaria and filarioids was considered not feasible in a sandy environment.

#### Followup

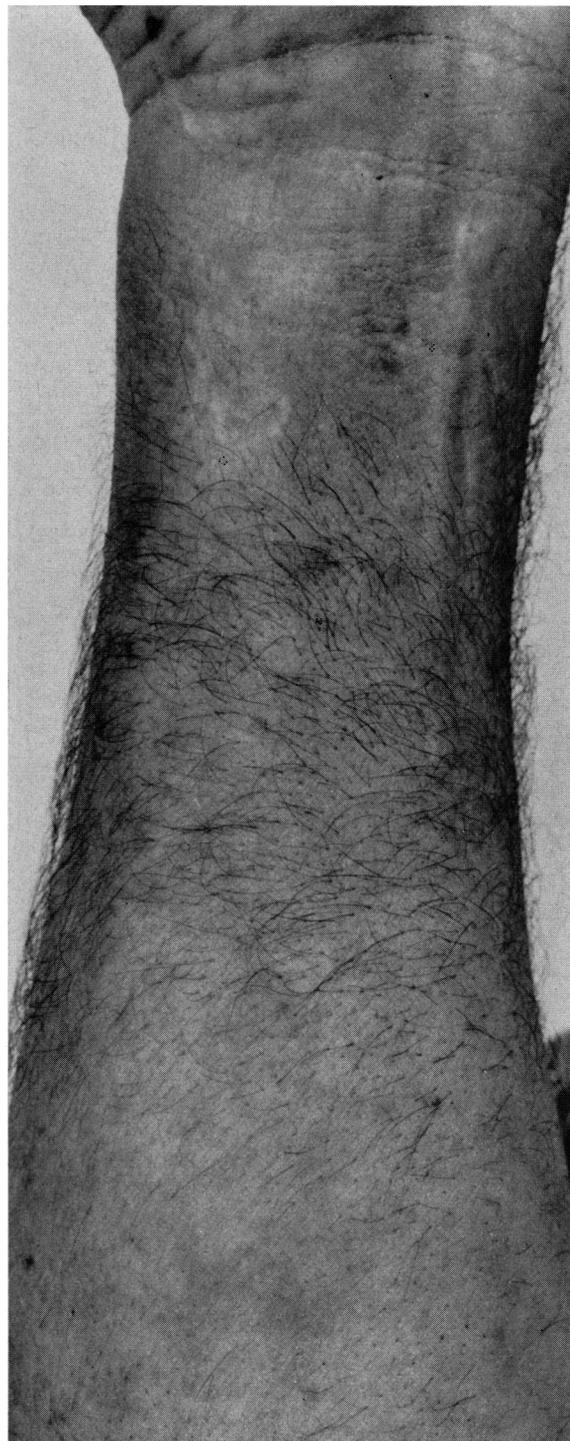
On September 5, 1964, a pesticing concern sprayed a solution containing 4,000 pounds of sodium borate on the soil of the crawl space and informed the general contractor that larvicidal effects would last 1 year. The firm also recommended that employees wash with a chlorine solution before they entered the crawl space each day.

An investigation 6 months later revealed that the infected employees had gained relief from treatment and that none had been reinfected during daily exposure to the treated crawl space soil. Employee 2, whose initial lesions are

shown in figure 2, was again photographed to demonstrate the post-infection disfiguring scars (fig. 4).



**Figure 3.** Atypical lesions (upper left quadrant of back) of employee 3



**Figure 4.** Arm lesions of employee 2 at 6 months' followup

Although natural entrances to the crawl space were restricted as much as possible, employees periodically noted cats in the crawl space.

### Summary

During the construction of a new hospital at Patrick Air Force Base, Fla., seven of nine employees working in the crawl space below the building developed severe dermatitis. The skin eruptions were attributed to exposure to larva of *Ancylostoma braziliense*. The men lay on their backs or sides on the ground in a 3-foot-high crawl space to install and paint pipes suspended from the floor above.

The workers reported that they frequently saw tracks of dogs and cats in the area when they began work in the mornings. In Florida the incidence of *A. braziliense* in these animals is high, and the moist sandy loam in the shady crawl space particularly favored the development of ova. Feline feces buried at night in the soil served as a vehicle of infection when the

fecal material touched the workers' arms, legs, and backs.

Ethyl chloride spray was prescribed for the dermatitis. Control measures recommended for the crawl space were the screening of entrances to prevent entry of animals, spraying the larvicide sodium borate at concentrations of 10 pounds per 100 square feet of soil, covering the earth with heavy plastic sheeting for the workmen to lie on whenever possible, and encouraging the men to wear long-sleeved shirts, secure trouser legs at the ankles, and shower immediately after work. A 6-month followup indicated that none of the men were reinfected after the larviciding of the crawl space soil.

### REFERENCES

- (1) Kirby-Smith, J. L., Dove, W. E., and White, G. F.: Creeping-eruption. *Arch Derm Syph* 13: 137-173 (1926).
- (2) Faust, E. C., Beaver, P. C., and Jung, R. C.: *Animal agents and vectors of human disease*. Ed. 2. Lea & Febiger, Philadelphia, 1962, p. 280.

## Administration on Aging

The newest of the U.S. Department of Health, Education, and Welfare's seven major operational agencies is the Administration on Aging, signed into law July 14, 1965, as part of the Older Americans Act.

The agency will serve as a clearinghouse for information about problems of the aged and aging; assist the Secretary in matters pertaining to the aged and aging; administer grants provided under the Older Americans Act; develop plans and conduct and arrange for research and demonstration programs in the field of aging; give technical assistance to States regarding programs for the aged and aging; prepare, publish, and disseminate educational materials dealing with the welfare of older persons; gather statistics in the field of aging; and stimulate more effective use of existing resources and available services for the aged and aging.

The Commissioner on Aging, who serves as chairman of a 15-member Advisory Committee on Older Americans, created by the act, is William D. Bechill, of Fair Oaks, Calif., formerly executive secretary of the California Citizens' Advisory Committee on Aging and special consultant to the California Department of Social Welfare.

The Older Americans Act provides grants to States to help strengthen State agencies which are responsible for establishing and improving programs and services for older people in their communities. Grants are also authorized to public or nonprofit private agencies or organizations and to institutions for research, development, and professional training.

The functions of the former Office of Aging have been transferred to the Administration on Aging.